Charles Darwin University

Final Examination

Family Name						
Given Name/s						
Student Number						
Teaching Period	Semester 2, 2018					

ENG267 – Hydraulics and Soil Mechanics	DURATION	
	Reading Time:	10 minutes
	Writing Time:	120 minutes

INSTRUCTIONS TO CANDIDATES
Answer all questions If necessary make appropriate assumptions and state your assumptions
EXAM CONDITIONS
<u>You may begin writing from the commencement of the examination session.</u> The reading time indicated above is provided as a guide only.
This is a CLOSED BOOK examination
Any non-programmable calculator is permitted
No handwritten notes are permitted
No dictionaries are permitted

ADDITIONAL AUTHORISED MATERIALS	EXAMINATION MATERIALS TO BE SUPPLIED
No additional printed material is permitted	1 x 16 Page Book 1 x Scrap Paper Formula Sheet/s

THIS EXAMINATION IS PRINTED DOUBLE-SIDED.

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SECTION A

Answer all questions in this section
Each question worth 4 marks (Total Marks 40)

Wherever possible use sketches and diagrams to explain your answer.

Q.1
What is Plastic Index? What does the Plastic Index indicate about the properties of soil?

Q. 2
What properties of soil contribute to the shear strength of soil?

Q. 3
Compute an approximate value for the coefficient of permeability for soil with $D_{10} = 0.17$.

Q. 4
With the use of a sketch, explain what a flow line is and what an equipotential line is.

Q. 5

Given a void ratio, of 0.874, what is the value of porosity?

Q. 6
Explain how the classification of soil is done.

Q. 7
Define Density Index and explain the use of it.

Q.8

Explain how the properties of soil can be improved to sustain a bigger load.

Q9
What are the major property differences between clay and sand?

Q10
Define coefficient of permeability.

SECTION B (Total Marks 60)

Answer all questions in this section.

Q. 1 (15 Marks)

The void ratio of a clay sample is 0.73 and the specific gravity 2.65. If the voids are 90% saturated find the bulk density, the dry density and the moisture content.
What would be the water content for complete saturation, the void ratio being the same?

Q. 2 (15 Marks)

A sample was tested in a falling head permeameter. The results were as follows. Determine the permeability of the soil.

Initial head of water in stand pipe = 1500mm
Final head of water in stand pipe = 605 mm
Duration of test = 280s
Sample length = 150 mm
Sample diameter = 100 mm
Stand pipe diameter = 5mm

Q. 3 (15 Marks)

a. Explain the object of classifying soil for engineering purposes.
b. What are the physical properties and factors which are considered in classifying a soil?
c. Explain the use of the compaction test in relation to building a road pavement.

Q. 4 (15 Marks)

a. With the aid of sketches, explain how a flow net can be used to calculate the permeability and the seepage loss.
b. Explain how the pumping out test can be used to determine the permeability in the field.

ENG267-Hydraulics and Soil mechanics
Formula Sheet for Soil

Void ratio $e = V_v/V_s$
Porosity $n = V_v/V_t$
$h_c = 0.15/D_{10}$
Degree of Saturation $S = (V_W/V_v) \times 100\%$
Moisture content $w = (M_w/M_s) \times 100\ \%$
Porosity $n = e/(1+e)$
Bulk Density $p_b = p_w(G_S+eS_r)/(1+e)$
Dry Density $p_d = (p_wG_s)/(1+e) = p_b/(1+w)$
Saturated Density $p_{sat} = ((G_s+e)/(1+e))p_w$
Water Content $w = (se)/G_s$
$K = (QL)/(Ah_L)$
$K = ((al)/(At))\ln(h1/h_2)$
$K = (Q/\pi(h_2^2-h_1^2))\ln(r2/r_1)$
$Q = kh_L(N_f/N_d)(a/b)$
$K = (q \ln r_{2/}r_1) / (h_2^2 - h_1^2)\ \pi$